

1969 FIRST CDC 7600



The arrival of the first CDC 7600 continued a long period of Livermore leadership in computing and custom software development for nuclear design and plasma simulations.

Timesharing and Two-Dimensional Modeling

Always eager for better computer simulations, Laboratory weapons designers enthusiastically greeted the arrival of their first CDC 7600 supercomputer in 1969. Nineteen of the first 20 scientific computers purchased by the Laboratory had been from IBM. That string was broken in 1962 when the Lab bought a CDC 1604 mainframe from then-upstart Control Data Corporation of Minnesota.

A young CDC engineer named Seymour Cray was already at work on an innovative design for a machine 50 times faster than the CDC 1604, and Livermore happily acquired one of his CDC 6600 computers for \$8 million in August 1964. Cray's design team then further refined this approach, yielding the even larger and faster CDC 7600 in 1969. In the hands of Laboratory users, these machines defined scientific supercomputing for a decade. Their small instruction sets, fast clock speeds, extremely dense custom-soldered circuit boards, and clever use of the machine frame itself for cooling were ideal for nuclear design and plasma simulations.

Laboratory computer scientists responded to the availability of the CDC 6600 and CDC 7600 with a long, fertile period of custom software development. The Livermore Time Sharing System (LTSS) enabled hundreds of users to run application codes simultaneously and tune them interactively. Large libraries of Fortran subroutines evolved, optimized for the Laboratory's mathematical and graphical needs. The local job-control language, online documentation system, and file-storage service set the standards in their fields, as did the whimsically named Octopus network that efficiently connected hundreds of remote terminals and printers to the central, shared computers.

This combination of leading-edge hardware and innovative support software yielded many benefits for the two-dimensional modeling projects then under way at Livermore. Better, higher-resolution simulations clarified important aspects of ongoing field tests. New experiments could be optimized at the desktop. And scientists gained increased understanding of the physics underlying many Laboratory projects.

The Laboratory's collaboration with Seymour Cray continued for another 15 years as well. In 1972, he

started his own company (Cray Research) and developed his first integrated-circuit (chip-based) scientific computer, the CRAY-1. As they became available, Livermore acquired early serial-number versions of every Cray Research machine, refining the Cray Time Sharing System (formerly LTSS) to make the most of each new generation of hardware.

In 1985, when the Laboratory received the world's first CRAY-2 supercomputer, it finally retired its last CDC 7600. In many ways, the hardware-software combination pioneered here was the model on which the National Science Foundation supercomputer centers later were created.



The innovative Livermore Television Monitor Display System, or TMDS (above), was a familiar sight in the 1970s, providing visual information to users. Data management and storage were improved with the first "chip" storage of the IBM Photostore system (left). It was designed to store online an astonishing (at the time) 1 trillion bits of data.